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IPOS – NOT SO MUCH MONEY ON THE TABLE.
THE COST COMPENSATION HYPOTHESIS

One of the most extensively documented anomalies concerning initial public offerings is IPO underpricing. Although the phenomenon is well analyzed and explained, most of the research ignores an individual investor's costs, constraints and perspective. We suppose that after taking these issues into consideration, there may be not much money left on the table.

The paper consists of three main parts. First, we characterize IPO underpricing anomaly and review the performance patterns from many countries together with their theoretical explanations. In the second section, we indicate the usually ignored issues which may potentially significantly impede IPO investments. The last part of the paper presents the empirical analysis based on 209 offerings in the Polish stock market between 2001 and 2010. The paper comes to the conclusion that high IPO returns result from just a few outliers and are not significantly higher than the benchmark returns. As we have hypothesized, IPO underpricing seems to be just a compensation for costs and time constraints faced by investors.

Keywords: post-IPO performance, Polish stock market, underpricing, long-term underperformance, hot issue markets

JEL Code: G11, G12, G14

INTRODUCTION

There is a lot of evidence of high volatility of IPO rates of return observed around the world: from the very high ones on the first day of public trading to their underperformance in the long run. It is important to find similarities in stock movements and its applicability in an investment strategy. One of the best documented anomalies connected with initial public offerings is IPO underpricing. Nonetheless, in our opinion, most of the research ignore the vast array of crucial issues connected with market microstructure, for instance transaction fees, waiting periods, and the influence of the hot-issue market phenomenon. Taking all these facts into consideration may significantly decrease IPO returns and, actually, even neglect the existence of the anomaly. In this study, we want to investigate the undepricing phenomenon in the Polish market and verify whether it is

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statistically significant after accounting for technical issues important from an individual investor's perspective. In other words, our hypothesis states that the seemingly abnormal returns during initial offerings are just a compensation for costs and constraints faced by investors in IPO investments.

Lately, the Warsaw Stock Exchange (the WSE) has been very attractive for developing companies seeking cheaper capital. We will use 206 companies offered on the WSE between 2001 and 2010. In order to verify the existence of the "money left on the table" anomaly[1], we will simulate an investment strategy based on Polish IPOs. We will then analyze the results of the strategy and compare it with passive benchmarks.

In the first chapter, we review existing explanations and statistical evidence of the aforementioned phenomenon in foreign countries. In the second part, we present a detailed set of additional issues which may influence the performance of IPO investing, and try to assess them. The aim of this discussion is to design a realistic IPO-based investment strategy. The last chapter includes a simulation of the strategy in the Polish market and an assessment of its results. To our empirical studies we used data from the Warsaw Stock Exchange, companies' reports and investment banks' archives.

1. THE IPO UNDERPRICING ANOMALY

Most common and possibly the first empirical regularity which was observed on the new issue market is the fact that companies actually underprice their share value in the process of going public. There has been an ongoing debate worldwide whether this anomaly is an example of market inefficiency, and if so, whether it resulted from the irrational behaviour of investors or whether it reflects institutional limitations.

IPO underpricing gives on the one hand the possibility of abnormal profits for privileged investors, who could acquire stock in the offering; on the other, it offers an opportunity cost of going public to the firm's old shareowners. An initial public offering represents the first opportunity which a firm's owners and initial investors have to begin the process of realizing the value for their ownership stake in the firm. Table 1 presents comparative

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[1] According to Ritter (2006), "the amount of money left on the table is defined as the difference between the closing price on the first day and the offer price, multiplied by the number of shares sold. In other words, this is the first-day profit received by investors who were allocated shares at the offer price."

initial returns which show evidence of underpricing in many countries. Most evidence comes from the United States and United Kingdom research but other countries present more current studies, reflecting high returns from the 1980s up to 1990. The initial return that investors could gain exceeds zero in all countries. Moreover, first-day premium averages around 15 percent in industrialized countries and about 60 percent in emerging markets, all measured from subscription to the first day of trading.

Table 1

Initial returns in major capital markets

Country	Study	Sample	Sample period	Initial Return
Australia	Lee, Taylor and Walter	266	1976-1989	11.90%
Australia	Finn and Higham	93	1966-1978	29.20%
Australia	Woo	115	1990-1995	12.40%
Austria	Aussenegg	67	1964-1996	6.50%
Belgium	Rogiers, Manigart and Ooghe	28	1984-1990	13.70%
Brazil	Aggarwal, Leal and Hernandez	62	1979-1990	78.50%
Canada	Jog & Riding; Jog and Srivastava	254	1971-1992	7.40%
Canada	Kryzanowski and Rakita	242	1993-1999	7.20%
Chile	Aggarwal, Leal and Hernandez	19	1982-1990	16.30%
China	Datar and Mao	226	1990-1996	388%
China A-shares	Mok and Hui	87	1990-1993	289%
China B-shares	Mok and Hui	22	1990-1993	26.00%
Denmark	Bisgard	32	1989-1997	7.70%
Denmark	Jakobsen and Sorensen	117	1984-1998	5.40%
Finland	Keloharju	91	1984-1992	14.40%
France	Husson and Jacquillat; Leleux and Muzyka; Paliar	187	1983-1992	4.20%
France	Jacquillant	180	1972-1986	480%
Germany	Ljungqvist	180	1970-1993	9.20%
Greece	Kazantzis and Levis	79	1987-1991	48.50%
Greece	Kazantzis and Thomas	129	1987-1994	50.90%
Hong Kong	McGuinness; Zhao and Wu	334	1980-1996	15.90%
India	Krishnamurti and Kumar	98	1992-1993	35.30%
Israel	Kandel, Sarig and Wohl	28	1993-1994	4.50%
Italy	Cherubini and Ratti	75	1985-1991	29.70%
Japan	Fukuda; Dawson; Hebner; Hamao, Ritter	975	1970-1996	24.00%
Japan	Jenkinson	48	1986-1988	54.70%

Netherlands	Buijs and Eijgenhuijsen	72	1982-1991	7.40%
Korea	Dhatt, Kim and Lim	347	1980-1990	78.10%
Malaysia	Isa	132	1980-1991	80.30%
Malaysia	Dawson	21	1978-1983	167%
Mexico	Aggarwal, Leal and Hernandez	37	1987-1990	33.00%
Nigeria	Ikoku	63	1989-1993	19.10%
Netherlands	Wessels; Eijgenhuijsen and Buijs	72	1982-1991	7.20%
New Zealand	Vos & Cheung	149	1979-1991	28.80%
Norway	Emilsen, Pedersen and Saettern	68	1984-1996	12.50%
Portugal	Alpalhao	62	1986-1987	54.40%
Philippines	Sullivan and Unite	104	1987-1997	22.70%
Singapore	Lee, Taylor and Walter	128	1973-1992	31.40%
Spain	Rahnema, Fernandez and Martinez	71	1985-1990	35.00%
Sweden	Rydqvist	251	1980-1994	34.10%
Switzerland	Kunz and Aggarwal	42	1983-1989	35.80%
Taiwan	Chen	168	1971-1990	45.00%
Thailand	Wethyavivorn and Koo-smith	32	1988-1989	58.10%
Turkey	Kiymaz	138	1990-1995	13.60%
Turkey	Ozer	89	1989-1994	12.20%
United Kingdom	Dimson; Levis	2,133	1959-1990	12.00%
United Kingdom	Jenkinson and Mayer (placings)	143	1983-1986	10.70%
United Kingdom	Jenkinson and Mayer (fixed price)	68	1983-1986	4.70%
United Kingdom	Jenkinson and Mayer (tender offers)	26	1983-1986	-2.20%
United States	Ibbotson, Sindelar and Ritter	13,308	1960-1996	15.80%
United States	Ritter(commitment offerings)	664	1977-1982	14.80%
United States	Ritter (tender offers)	364	1977-1982	47.80%

Source: own study based on T. Jenkinson, et al. 2001, and J. R. Ritter, 1998

Although the average first-day returns seem to be considerable, it is important to note that, according to some authors, only some IPOs are underpriced (according to Megginson, about 60%) and the median underpricing is significantly lower than the mean (Megginson, 1997).

Theory suggests that in an efficient and perfect market, issuers should not leave money on the table in such huge quantities but it happens frequently. To explain this market imperfection, numbers of reasons have been discussed for the initial return phenomenon. Those diverse theories focused on various relations between issuers, investors and investment bankers helping in the IPO process. Overall, these theories are not mutually exclusive but some explanations can be more significant for some IPOs than for others.

There are some reasons why IPOs are much more underpriced in emerging-markets than in the US or UK ones. According to Jenkinson and Ljungqvist (2001) one of the reasons is bureaucracy and political meddling. For example, Korean companies had to evaluate the price of shares at book value until 1993, while Taiwanese firms were pricing shares based on the price-earnings ratio and other specifications of not exactly comparable firms. Malaysian new issues of a highly discounted stock were used to buy influence within the political world. Moreover, Japanese Recruit Cosmos Company wanted to gain political privileges via the targeted issue of deeply underpriced shares. After those scandals, the Japanese government allowed to price shares using auction, which consequently reduced average underpricing from 70 percent to just 12 percent. Comparable effects were observed in Korea, Malaysia and other liberalizing countries. Similarly to Japan, auction-like pricing mechanisms, such as a tender offer, in the UK, the Netherlands, France, Chile and Belgium are connected with a lower level of underpricing. Nonetheless, companies around the world are not willing to shift towards frequent use of auctions, and tenders remain quite rare in most countries. Moreover, in such countries as the Netherlands, the UK and Japan, auctions have been replaced by bookbuilding or fixed prices; France is the country where auctions are often used in the process of going public.

The winner's curse hypothesis

Another possible explanation for the underpricing of new issues can be the "winner's curse" theory (Rock 1986). As we have presented earlier, most of the new shares are sold at a fixed offering price. This can be effective if suddenly demand becomes very high. Wrong distribution itself does not cause underpricing but if some investors are relatively better informed than others, if they are more convinced to buy shares when shares are underpriced, then the amount of surplus demand will be growing if deeper underpricing occurs. Investors face a winner's curse in a situation when they buy all of the stock they ask for, because well-informed investors do not want to purchase the shares. In the case of this adverse selection dilemma, the less informed investors will send buy orders only if, generally, the IPOs are underpriced adequately to compensate for the favouritism in the allocation of new issues. Despite the evidence in the form of the winner's curse, other theories of IPOs underpricing exist.

The market feedback hypothesis

In the case of bookbuilding in issue pricing, investment bankers could try to underprice new shares in order to persuade regular investors to promote a company during the pre-selling stage, which could be helpful in the later stage of pricing the issue (Jegadeesh, Weinstein and Welch 1993, Van Bommel 2002). In order to encourage regular investors to openly expose their pricing, the investment banker must compensate for this during the underpricing process.

The bandwagon hypothesis

When investors are interested not just in information about a particular offering, but want to know if other investors are buying this issue as well, the bandwagon effects may occur (Welch 1992). If one investor notices that no one else wants to purchase the issue, he or she may make a decision not to purchase it even if the information about the issuing company is positive. To prevent such a situation, issuers could underprice offered stock to attract the first few investors to purchase it and persuade a bandwagon, or a cascade, where other investors want to purchase not on the basis of the information at hand. The market feedback hypothesis in combination with the bandwagon effect can cause positively sloped demand curves. In the market feedback theory, the issue price is revised upwards if regular investors show positive information. Other investors, predicting that this can be only a limited revision, correctly assume that these issues can be underpriced. Therefore, these investors will buy extra stock, causing a positively sloped demand curve. But there is another side: if investors understand the underprice of an offering as a weak demand from other investors, deep underpricing in this case might frighten potential investors who will wonder why the company needs the cash so desperately. This fact is dangerous for the issuer and the only solution is to delay the IPO, and hope for market conditions to get better.

The investment banker's monopsony power hypothesis

An additional elucidation for the IPOs underpricing phenomenon argues that investment bankers benefit from their greater knowledge of market conditions; therefore, by underpricing, they can spend less on marketing and attract more investors (Ritter 1984, Chalk and Peavy 1987). This activity is

often undertaken, especially with less sophisticated issuers; even when the investment banking firms go public, they underprice themselves as well as IPOs of similar size. Investment bankers still convince clients and regulatory bodies that underpricing is a common fact for IPOs. Moreover, investment bankers use undervaluation as a guarantee to minimize future lawsuits for any material errors. In this case, underpricing is quite an expensive insurance against future potential litigation from dissatisfied owners.

The signalling hypothesis

If an IPO is a success even with costs of underpricing it leaves investors satisfied (Allen and Faulhaber 1989, Grinblatt and Hwang 1989, Welch 1989, Chemmanur 1993). This allows a company and insiders to successfully conduct future offerings at a better price. Such a good reputation effect had a place in several signalling models. Companies using this model have confidential information about their true values despite the fact they still agree to underprice the issue. It is possible to apply the frequent issue strategy then, and the new issue is followed by successful offerings later on. If only companies knew a cheaper way to signal quality of issue and lower capital costs, they would probably choose not to undervalue shares so deeply.

The ownership dispersion hypothesis

Underpricing the new issue can be used intentionally by a company in order to create surplus demand and attract higher number of small investors (Booth and Chua 1996) This strategy leads to dilution of ownership which will in fact both enlarge the liquidity of the stock and create protection from competition willing to take over the firm. Since the greater underpricing occurs and there is an opportunity to choose preferable shareholders, the possibility of future challenges to the founders' control is lower.

IPO as tax-efficient compensation

Lastly, in some countries, an issue undervaluation can be a tax-efficient method to compensate employees. According to Rydqvist (1997), the comparatively lower taxes on capital income in contrast with a high tax on employment gains, attract Swedish companies to underprice shares deeper than in the case of the lack of tax advantages.

The cost compensation hypothesis

In our opinion, the IPO abnormal returns may constitute a compensation for various costs, such as transaction costs and money transfer costs. What is more, many technical and market microstructure questions (frequency of IPOs, waiting periods, settlement periods etc.) imply that, although an average IPO could be underpriced, the IPO investment strategy may not be profitable. These issues were already, at least selectively, raised by, for instance, Fung, Cheng and Chan (2004) and Fung and Che (2010), but to the best of our knowledge, no one has fully discussed them yet.

2. INDIVIDUAL INVESTOR'S PERSPECTIVE – IS MONEY REALLY LEFT ON THE TABLE?

The traditional IPO research is based on average rates of returns during the first day of trading. However, an individual investor needs to take many more issues into consideration than the mere raw interest rate. We discuss the most essential issues below.

Transaction costs

Transaction costs include four main areas: a transaction fee, markets spread, slippage and market impact. Full modelling of transaction costs is fairly complex and usually demands employing quadratic or parabolic functions (Narang 2009). However, unless the investment strategy includes very large capital flows, it is sufficient to consider only the first two factors. The transaction fees offered to individual investors in the Polish stock market are relatively flat and remain the same in various brokerages. The typical transaction fee on an order executed on the Internet (the most cost-effective way) is equal to 0.39 percent. In order to implement the IPO investing strategy, it is important for the fee to be paid twice on each trading occasion; both when you buy and when you sell stocks.

The other cost is bid-ask spread. According to the semi-annual report issued by the Warsaw Stock Exchange, the average bid-ask spread in the first half of 2010 was 164 basis points[2]. The full distribution of the average

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[2]http://www.gpw.pl/gpw.asp?cel=informacje_gieldowe&k=17&i=/statystyki/polroczne&sky=1, access 11 August 2010.

spreads of 372 companies listed in the WSE active market during the first half of the year 2010 is presented in Figure 1.
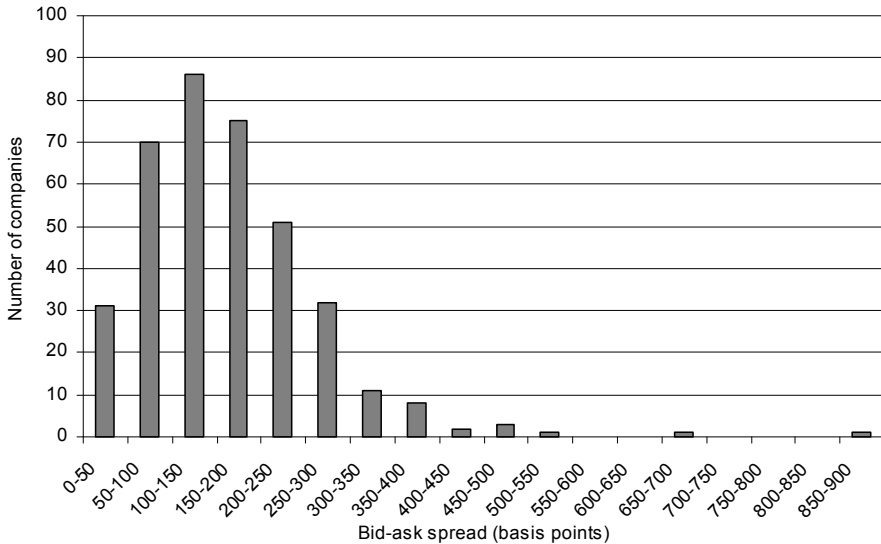

Figure 1. Average bid-ask spreads of companies listed on the WSE, 1H 2010

Source: own computations based on WSE semi-annual report

It is quite clearly presented in Figure 1 that the spread distribution is positively skewed. The larger spread is usually associated with smaller companies. It should also be noted that the spread usually increases during periods of increased risk premium and significant market downturns.

In the IPO strategy, the spread is paid only once when you sell the stocks, as the buy-order is executed in the active market. Naturally, an investor trying to sell stocks does not have to sell them using a market-order; however, even when using a limit-order, it is not possible to entirely mitigate the spread costs. This results from the fact that the sell limit-order is executed only after the market moves downwards by the size of the bid-ask spread.

In the strategy simulation presented in the next chapter, we have assumed that investors are able to mitigate half of the spread and pay on average 0.82 percent. However, it needs to be pointed out that this number may potentially underestimate the true spread paid by an investor due to relative

market stability in the estimation period and the positive correlation between the size of company and bid-ask spread. What is more, some authors suggest some correlation between IPO returns and the expected spread (Ellul and Pagano 2006), however we did not take this issue into consideration in our research.

Settlement period

In order to subscribe to some IPO offers, an investor needs to possess a sufficient amount of cash. It is important to point out that it actually can be nothing else but cash. This fact contrasts with purchases in the market which could be paid for with receivables. Therefore, in order to participate in an IPO process, an investor is forced to wait until settlement. The standard settlement period for stocks in Poland is three days.

Money transfer

With over 20 brokerages in the Polish financial landscape, IPO stocks are offered by various institutions. If an investor wishes to follow numerous offerings, he is forced to possess a few accounts and transfer money from one account to another. This difficulty is associated with two issues. First, money transfer takes time – up to two days. Second, a cost of transfer is involved; despite being small, it is not negligible. In the strategy simulation we assumed this cost equals 0.1 percent.

Waiting period

After the decision to subscribe to an IPO is made, an investor does not obtain stocks straight away. There is a considerable waiting period between the subscription period and the first trading day. We decided to estimate the length of the waiting period based on IPOs in 2009 and in the first seven months of 2010. The IPOs are listed in Table 2.

Table 2

Average waiting periods before IPOs in Poland, January 2009 – July 2010

IPO	Last day of offer period	First day of public trading	Waiting period (days)
Bumech	2008-12-15	2009-01-14	30
GPM Vindexus	2009-03-09	2009-03-23	14
Aplisens	2009-04-29	2009-05-25	26
LW Bogdanka	2009-06-10	2009-06-25	15
Delko	2009-09-02	2009-09-18	16
Arctic Paper	2009-10-12	2009-10-23	11
Patentus	2009-10-14	2009-11-09	26
PGE	2009-10-27	2009-11-06	10
Intakus	2009-12-07	2009-12-22	15
PCC Intermodal	2009-12-09	2009-12-18	9
Eko Holding	2010-03-02	2010-03-24	22
Ferro	2010-03-25	2010-04-14	20
Berling	2010-03-30	2010-04-15	16
PZU	2010-04-28	2010-05-12	14
Dolnośląskie Surowce Skalne	2010-05-06	2010-05-17	11
Kulczyk Oil Ventures	2010-05-07	2010-05-25	18
ABC Data	2010-05-25	2010-06-17	23
Tauron	2010-06-18	2010-06-30	12
Rank Progress	2010-06-18	2010-07-08	20
Harper Hygenics	2010-07-08	2010-07-23	15
Average			17

Source: own computations based on companies' public disseminations

The average waiting period of the IPOs listed in Table 2 was 17 days.

Frequency of IPOs

After unwinding the position in IPO stocks, an investor is usually not able to engage in the next trade right away. He is forced to wait for the next investment opportunity. The frequency of IPOs is highly dependent on market conditions. Table 3 lists the number of IPOs on the WSE for 2001-2010.

Table 3
IPOs on the WSE from January 2001 to July 2010

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of IPOs	8	5	6	36	52	38	81	33	13	14

Source: own computations based on www.gpw.pl.

Analyzing the 286 IPOs from January 2001 to July 2010, we observed, on average, one IPO per 12 days. This means, that assuming that an investor disengages from one IPO trade in any moment, they usually have to wait approximately 6 days for another one.

Order reduction

One of the frequently observed phenomena concerning IPOs is order oversubscription. When potential investors subscribe for more shares than are offered in the IPO process, the allotments are usually proportionally reduced. The size of the reduction may vary from 0 to almost 100 percent. Especially important is the fact that both the reduction and the IPO initial return result from high demand of investors, the both figures used to be positively correlated. The scenario based on the sample used in this research is depicted in Figure 2.
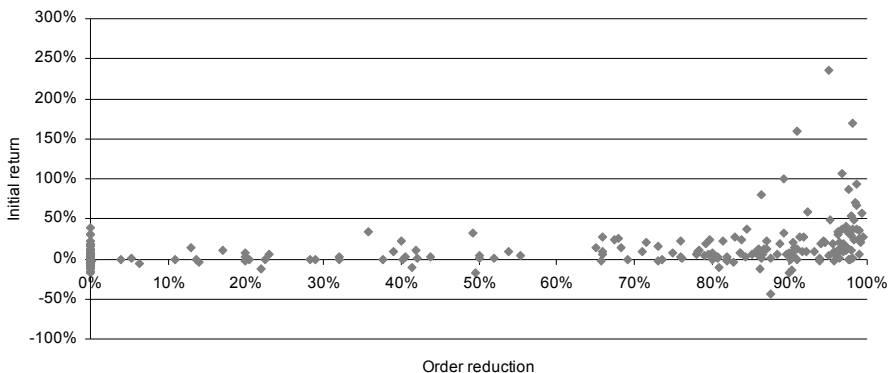

Figure 2. IPO order reduction and initial returns in Poland, January 2001 – July 2010

Source: own computations based on companies' disseminations and www.gpw.pl.

Although the correlation due to its nonlinearity is not visible at first glance, the simple Pearson linear correlation coefficient is equal to 0.33 and

it is statistically significant at a very high level with its t-statistic of 5.03. Therefore, taking into consideration both the size of the reductions and their positive correlation with initial rates of return, we think that it is necessary to account for them in the empirical research. The reduction may significantly reduce the rates of return (both positive and negative) during initial trading.

The issues described below may considerably influence the performance of IPO investments. Their impact is summarized in Table 4.

Table 4

Summary of IPO returns impact factors

Impact factor	Duration (days)	Cost
Money transfer	2	0.10%
Buy order transaction fee	N/A	0.39%
Sell order transaction fee	N/A	0.39%
Bid-ask spread influence	N/A	0.82%
Transaction settlement	3	N/A
Non-working day correction*	1	N/A
Waiting period	17	N/A
IPO frequency correction	6	N/A
Sum	29	1.70%

* Non-working day correction results from the fact that as money transfer and transaction settlement add up to 5 days, there is on average one additional weekend day within this period.

Source: own computations

Apart from the cost computations, there is also the issue of the total length of a single transaction, which needs to be commented on. The total duration of impact factors add up to 29 days. In other words, in order to execute a single IPO transaction an investor needs approximately one month, so it is not very likely that he would be able to make more than 12 transactions a year (without external financing). This issue is of crucial importance not only because of the alternative costs of the strategy. Even more noteworthy is the phenomenon of the most profitable IPOs often being clustered in a short period due to the hot issue market.

A second pattern observed in the IPO market is the existence of cycles both in the number and the average initial returns of new issuers. In research (Rajan and Servaes 1997) conducted in 1997, we can find evidence that not only analysts are optimistic about future earnings but issuers take advantage

of "the window of opportunity" as well. They find out that more US firms are going public during the over-optimism about other IPOs in the same sector. This phenomenon is illustrated as well in Ritter (1998) for IPOs between 1977 and 1996. Examination of these findings shows that high initial returns are followed by an increase in the number of IPOs. The cycles of high initial returns and increased quantity of new issues are known as hot issue markets. Rational explanations for the occurrence of hot issue markets are not easy to find. Hot issue markets have existed in many countries for many years. For instance, a hot issue market occurred in the United Kingdom after the period of fixed commission rates finished in October 1986; in South Korea a hot issue market was connected with a big bull market in 1988. Signalling theory suggests that hot issue markets are occupied by high quality issuers, while overoptimism hypothesis connects hot issue markets with investors' irrationality and managerial opportunities. To sum up, the researchers find no difference in operating returns between hot and cold issue markets.

The hot issue market is visible also in Poland. In Figure 3, we can see a positive correlation between average arithmetical rates of return on IPO investments and the number of IPOs in particular years. The correlation is clearly positive (ρ=0.65) and significant (t-statistic=2.26). The calculation takes into account only IPOs included in our sample.
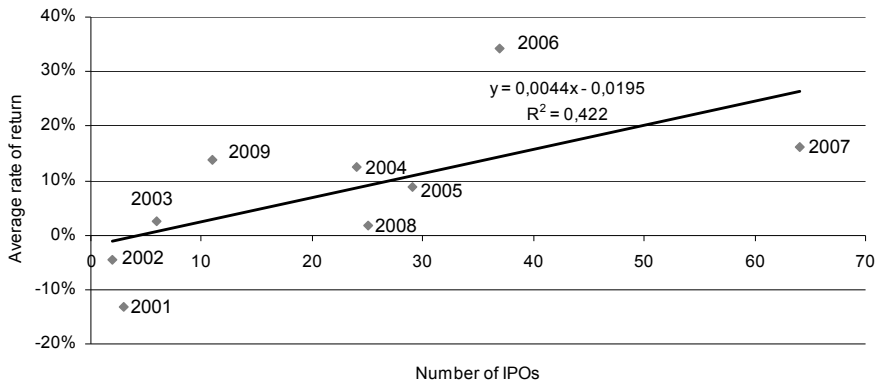

Figure 3. Correlation between number of IPOs and average rates of return in IPOs in Poland for 2001-2009

Source: own computations based on data from www.gpw.pl

The hot issue market may significantly impede the average rate of return on the IPO strategy. In periods of high IPO returns, an investor is not able to take part in all of them because he needs about one month for a single trade. Meanwhile, in periods of low IPO returns, he has enough time to participate (and probably lose money) in all the trades. This is one of the reasons why we think that calculations of a simple average rate of return of an IPO investment is not sufficient and it is necessary to examine a detailed investment strategy.

3. EMPIRICAL EVIDENCE OF THE POST-IPO PERFORMANCE IN POLAND

3.1. Data and methodology

In this chapter we want to examine the effects of the IPO underpricing in the Polish market. In order to test whether there is really money left on the table in the Polish IPO market, we designed an adequate investment strategy. The fundamentals of this strategy are as follows. An investor participates in an IPO procedure once a month. As we assessed in the previous chapter, it is not likely for an individual investor to have an opportunity to invest more often. We assumed that the investor does not use any external form of financing (debt), because the access to debt in Polish conditions is very limited both for institutional and individual investors. After stock purchase, the investor unwinds his position at the end of the first day of trading. As there are often many IPOs during one month and the investor may choose in which to invest, we decided to approximate the investor's return as the average return of all the IPOs in a particular month. If there are no IPOs in a certain month, we assume 0% return. The single rates of return on money invested in a single IPO and the monthly rates of return were calculated according to the equations (1) and (2).

$$r_i = \ln\left(\left(\left(\frac{P_{i1}}{P_{i0}} - 1\right) \times (1 - red_i) - c_t - (t_s + s_s) \times (1 - red_i) \times \frac{P_{i1}}{P_{i0}} - t_b \times (1 - red_i) + 1\right)\right)$$

$$(1)$$

where:
r_i – a single IPO rate of return,
P_{i1} – an IPO closing price on the first day of trading,
P_{i0} – an IPO offering price,

red_i – an offer reduction in the case of a particular IPO,
c_t – cost of bank transfer – 0.1 percent,
t_s – transaction fee when selling – 0.39 percent,
s_s – bid ask spread when selling – 0.82 percent,
t_b – transaction fee when buying – 0.39 percent.

$$r_m = \frac{\sum_{i=1}^{n} r_i}{n} \tag{2}$$

where:
r_m – monthly return on IPO strategy,
n – number of IPOs in a particular month.

To show the exact market performance of new issue companies, most researchers use certain benchmarks. Company's returns are calculated over the investment period and are neither annualized nor risk adjusted but generally market adjusted. For instance, Simon (1989) in his research uses average cumulative abnormal returns, and Ritter (1991) uses cumulative average adjusted returns calculated with monthly portfolio rebalancing. Some researchers, like Jain and Kini in their 1994 research, use operating profits; the aforementioned prove that share prices in a long-run performance clearly reflect the poor/unsatisfying long run operating performance of new companies. Others use asset pricing models such as the CAPM or the Fama and French three-factor model. According to Jenkinson, Ljungqvist (2001) this procedure is just as good as the one used in the benchmark one. We decided to use two benchmarks: WIG – the broadest Polish stock market index, and Bloomberg/EFFAS Polish Government Bond 1-3 Index – the index of short term bonds of the Polish government.

The study of the aftermarket performance of an IPO was conducted on historic data of companies listed on the main market of the Warsaw Stock Exchange, which had their IPOs from January 2001 to July 2010. We used the following in particular:

- daily closing prices of the stock from www.gpwinfostrefa.pl,
- data about volume of listed companies from www.gpw.pl,
- information about offer reductions from investment banks databases (DM BZ WBK) and public disseminations.

We excluded from the sample IPOs which:

- were conducted with special offer conditions (like for instance the case of PZU – maximum subscription quantity PLN 10 000,00, no leverage),
- were a simple transfer of stocks from one market to another,
- did not include stock offering (only "introduction" of stocks to the market),
- had no sufficient information available.

The aforementioned sample consisted of 209 separate IPOs, which took place between January 2001 and July 2010. The constituents of the full sample are presented in Appendix.

3.2. Study results

The simple average return on IPOs in Poland is clearly positive. In the analyzed sample the average logarithmic rate of return, calculated under assumption that an investor sold equities at the closing price of the first day of trading, was equal to 11.4 percent (before costs) and significantly exceeded 0 (*t-statistic*=8,22). However, as stated earlier, we decided to implement a complete trading strategy. The performance of the strategy is depicted in Figure 4.
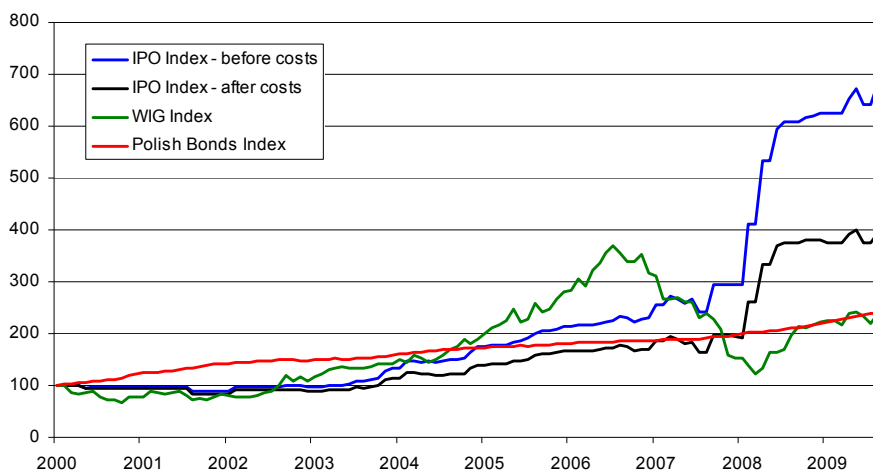

Figure 4. Performance of the IPO strategy

Source: own computations. All indices are initially rebased at 100.

In Figure 4 we see that the return on the IPO strategy from January 2001 to July 2010 did better than the equity and bond benchmarks on a raw-return

basis. The return was higher before accounting for costs and after subtracting them from the overall performance. Nonetheless, it is worth noting that both stocks and bonds outperformed the IPO investments up to the end of 2008. Table 5 gives some additional insights into the IPO strategy performance.

Table 5

The IPO strategy – quantitative insights

	IPO Index - before costs	IPO Index - after costs	WIG Index	Polish Bonds Index
Average*	1.67%	1.19%	0.75%	0.76%
Standard deviation	5.22%	5.04%	7.20%	0.72%
Skewness	3.22	2.97	-0.46	0.29
Kurtosis	15.75	15.50	1.43	1.85
Sharpe ratio	0.17	0.08	0.00	0.00
t-stat. (bonds)**	1.75	0.86		
t-stat. (stocks)***	1.05	0.51		

*All the distribution characteristics based on montly returns

**Bonds as risk-free asset proxy.

***Whether the IPO returns are significantly higher than the equity returns, normal distribution assumed.

****Whether the IPO returns are significantly higher than the bond returns, normal distribution assumed.

Source: own computations

The average monthly returns in Table 5 are considerably lower than the average 11.4% return mentioned earlier. The reasons include the costs, correlation between IPO frequency and average returns, order reductions and other issues mentioned before.

A few other interesting conclusions can be drawn from the table. First, the standard deviation of the IPO strategy is lower than the one of WIG. It seems that this strategy is less risky. What is more, it has very positive skewness and extremely high kurtosis, which induces option-like payoff. In fact, the inclusion of such assets in the portfolio is beneficial, as it allows to decrease the negative event risk. Besides, most of the classic asset classes, as stocks, commodities or corporate bonds have usually left-skewed distributions with higher than normal kurtosis, so the IPO strategy seems to be very healthy from the portfolio standpoint. However, it is necessary to point out that the Sharpe ratio is relatively small and the strategy returns are not significantly higher than those of either stocks or bonds.

As we noticed, the fairly impressive performance of the IPO strategy results to a large extent from a few positive outliers. Therefore, we decided to

do two things: assess a bootstrap standard error and resimulate the IPO strategy excluding outliers.

First, we calculated the bootstrap test in order to assess whether the IPO index performance after costs is significantly higher than zero. The great advantage of the bootstrap technique is that it makes no assumptions about underlying distributions, so it seems appropriate in the case of considerable skewness and kurtosis. We carried out a standard bootstrap procedure – we drew 500 random samples with repetitions from the IPO and WIG monthly returns' distributions and then compared the averages. We used an antithetic variates technique to increase the bootstrap efficiency, so in the end we obtained 1000 random samples. The distributions of both averages are presented in Figure 5. Table 6 provides some quantitative characteristics.
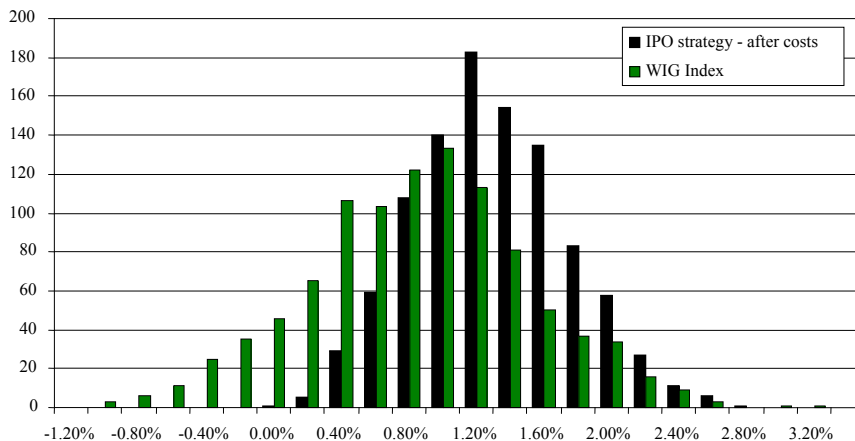

Figure 5. Bootstrap distribution of averages

Source: own computations

Table 6

Bootstrap method – quantitative statistics

	IPO strategy - after costs	WIG Index
Average	1.19%	0.75%
Standard error	0.46%	0.66%
t stat.	0.55	
p-value	29.10%	

Source: own computations

As can be seen in Table 6, after accounting for non-normality, IPO returns are actually not significantly higher than those of WIG. The bootstrap results confirm the interferences drawn from Table 5.

Secondly, we tested the IPO performance again excluding three biggest outliers in terms of r_i. The selected companies were Bumech, GPM Vindexus and Konsorcjum Stali. It is quite interesting that all the aforementioned bear a resemblance in the fact that initially there were much fewer subscribers than equities offered. Consequently, the offer price was assigned to the lower boundary of the offer spread. For instance, in the case of Bumech, individual investors subscribed for only 21,329 out of 500,000 shares offered in their tranche[3]. In other words, the most profitable IPOs (after costs, reductions etc.) were seemingly those in which very few investors participated. Taking this into consideration, the exclusion of outliers appears to be reasonably justified. The performance of the strategy without the three mentioned outliers is depicted in Figure 6.
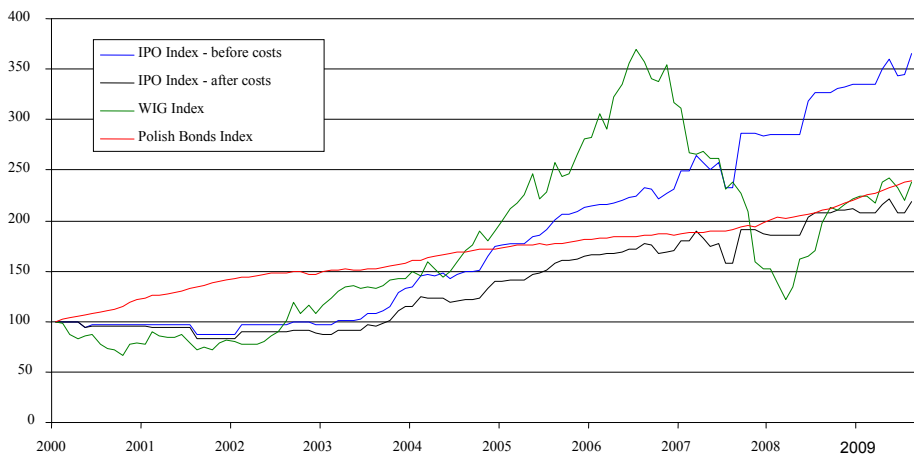
Figure 6. Performance of the IPO strategy after exclusion of the outliers

Source: own computations. All indices are initially rebased at 100.

Figure 5 actually confirms the thesis that the attractive performance of the IPO strategy was mainly due to just a few exceptionally positive outliers. After their exclusion, the average monthly performance of the IPOs is even lower than the one of WIG (Table 7).

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[3]http://www.bumech.pl/pub/File/raporty_bie%C5%BC%C4%85ce/Zakonczenie_Oferty_Publ
icznej.pdf

Table 7

The IPO strategy after exclusion of the outliers– quantitative insights

	IPO Index - before costs	IPO Index - after costs	WIG Index	Polish Bonds Index
Average*	1.13%	0.68%	0.81%	0.75%
Standard deviation	3.57%	3.47%	7.16%	0.75%
Skewness	1.54	0.92	-0.48	0.10
Kurtosis	8.71	8.39	1.53	1.88
Sharpe ratio	0.10	-0.02	0.01	0.00
t-stat. (bonds)**	1.05	-0.20		
t-stat. (stocks)***	0.40	-0.17		

*All the distribution characteristics based on monthly returns.

**Bonds as risk-free asset proxy.

***Whether the IPO returns are significantly higher than the equity returns, normal distribution assumed.

Source: own computations

Although the skewness and kurtosis of the IPO strategy is still highly positive, after accounting for the outliers' exclusion and costs, it performed worse than both stocks and bonds.

SUMMARY AND CONCLUSIONS

This paper has focused on the IPO post-offering performance. We have proved that the "money left on the table" pattern on the Polish IPO market is quite similar to those observed in many other countries. The average first day returns are much lower than the average first day returns in emerging markets and slightly higher than in industrialized ones. However, after accounting for many biases, costs and time constraints which are present from the individual investor's perspective, the picture is no longer so obvious. The rates of return on the IPO strategy designed and tested by us were not significantly higher than those of stocks and bonds. Additionally, the distribution of the IPO strategy is characterized by exceptionally high kurtosis and skewness, which suggests that its performance is a result of just a few positive outliers. After the exclusion of the three most outlying IPOs from our sample, the IPO strategy offered no abnormal returns for investors. Summing up, the study does not confirm that there is any money left on the table for individual investors. The apparent underpricing seems to be just a

compensation for various costs and time constraints faced by investors subscribing to IPOs. It is consistent with our initial "cost compensation hypothesis".

However, the results need to be investigated more thoroughly. The future studies may concentrate on increasing the sample, focusing on different markets and more in-depth investigation of influence of the bid-ask spread or a waiting period. Nonetheless, for the time being, we cannot confirm the thesis of any "money left on the table".

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APPENDIX

IPO sample

Company	IPO date	Offer price (PLN)	Closing price on the first trading day (PLN)	Offer reduction
Interia.pl	2001-04-02	23.00	12.80	87.6%
Getin	2001-05-10	3.50	3.54	50.0%
Hoga.pl	2001-05-24	4.50	4.65	0.0%
Eldorado	2002-01-03	15.00	15.00	22.5%
Kruk	2002-07-02	35.00	31.80	0.0%
Duda	2003-01-30	20.00	22.00	0.0%
Hoop	2003-08-06	21.00	21.60	0.0%
Impel	2003-11-14	26.00	28.00	83.7%
Redan	2003-12-30	18.30	18.15	80.0%
Śnieżka	2003-12-31	29.10	29.50	93.8%
ATM Grupa	2004-02-05	36.00	44.20	81.5%
DGA	2004-04-20	27.50	30.00	95.7%
GTC	2004-05-06	87.00	92.50	78.0%
Techmex	2004-05-19	30.00	31.80	86.6%
FAM	2003-11-04	17.00	15.90	0.0%
Intercars	2004-05-26	21.00	22.00	79.1%
Artman	2004-06-04	19.00	20.90	17.0%
JC Auto	2004-06-30	27.00	30.80	65.0%
Hygienika	2004-07-05	15.00	13.10	22.0%
Mediatel	2004-07-05	69.00	68.50	3.9%
Nowa Gala	2004-07-14	5.00	7.40	95.2%
RMF FM	2004-07-14	83.00	83.40	0.0%
Elstar Oil	2004-07-16	30.00	41.40	84.5%
PBG	2004-08-02	32.00	39.10	87.0%
Comp Rz.	2004-09-27	94.00	120.00	83.0%
ATM	2004-09-28	22.00	23.90	66.0%
Swissmed	2004-10-15	2.80	3.12	0.0%
WSIP	2004-11-03	9.00	10.90	90.4%
Torfarm	2004-11-22	34.50	43.50	68.0%
Pekaes	2004-11-26	9.50	10.25	75.0%
Koelner	2004-11-30	11.00	12.00	53.8%
TVN	2004-12-07	33.50	35.20	95.9%
Dwory	2004-12-20	37.00	39.00	85.2%
Drozapol	2004-12-23	3.20	3.35	90.1%
Eurofaktor	2004-12-23	18.00	18.55	20.0%
Atlanta	2005-01-10	10.50	12.60	71.6%
Comp	2005-01-14	37.50	50.00	35.7%
Zelmer	2005-01-27	13.20	18.00	98.7%
Eurocash	2005-02-04	3.10	3.17	43.8%
Graal	2005-02-11	15.00	14.90	0.0%
Śrubex	2005-02-17	50.00	55.00	96.3%
ZTSErg	2005-02-18	7.00	7.25	89.9%
Polmos L.	2005-02-24	50.00	55.00	97.2%
Zetkama	2005-03-04	14.00	12.60	80.9%
Bioton	2005-03-16	2.75	3.27	95.6%
Amrest	2005-04-27	24.00	24.50	32.0%
Polmos Biał.	2005-05-12	80.00	77.80	95.8%
PEP	2005-05-13	7.80	7.00	41.4%
Lena	2005-06-01	7.10	7.85	0.0%
Lotos	2005-06-09	29.00	32.00	96.6%
Decora	2005-06-21	22.50	23.90	79.5%
Ambra	2005-06-22	9.50	9.50	69.1%

Company	IPO date	Offer price (PLN)	Closing price on the first trading day (PLN)	Offer reduction
Opoczno	2005-06-24	55.00	55.00	73.6%
Variant	2005-07-11	10.00	10.30	0.0%
Travelpl	2005-07-12	18.00	22.40	79.7%
Police	2005-07-14	10.30	10.60	82.0%
Spray	2005-07-21	8.10	7.90	0.0%
IDM SA	2005-07-27	12.00	13.00	71.0%
EMC	2005-07-29	7.60	7.80	40.6%
Barlinek	2005-09-22	7.30	8.25	87.0%
PC Guard	2005-10-05	6.00	7.60	66.0%
TETA	2005-11-29	10.20	12.50	76.0%
Toora	2005-12-13	15.80	17.25	90.4%
Novitus	2005-12-22	15.30	16.00	90.4%
Mewa	2006-01-03	2.40	4.50	97.6%
Infovide MX	2006-01-11	25.00	31.00	98.3%
Nortch Coast	2006-04-10	3.35	4.15	83.8%
Cash Flow	2006-05-16	8.00	9.70	96.5%
Eurofilms	2006-06-12	4.00	4.05	80.7%
Bankeir.pl	2006-06-19	7.50	7.95	85.9%
Pamapol	2006-06-20	11.00	11.10	87.5%
Mispol	2006-06-22	8.00	9.85	40.0%
GINO Rossi	2006-06-26	12.00	12.45	95.0%
Intersport	2006-07-11	8.00	8.30	55.4%
E-Card	2006-07-12	2.00	2.65	89.2%
Inwest Cons.	2006-07-20	3.75	12.60	95.1%
Action	2006-07-24	12.00	13.90	73.0%
Qumak	2006-08-03	8.20	9.20	86.0%
Famur	2006-08-04	330.00	327.00	29.0%
Interferie	2006-08-10	6.00	6.50	91.6%
Astarta	2006-08-17	19.00	19.05	5.3%
Hyperion	2006-08-18	7.00	14.00	89.2%
O2O	2006-08-22	10.00	26.90	98.1%
Unima	2006-09-13	12.00	16.20	97.9%
AB	2006-09-21	11.50	11.54	86.3%
Euromark	2006-09-29	15.50	15.60	76.2%
Asseco Slov.	2006-10-10	250.00	280.00	91.0%
Dom Dev.	2006-10-24	85.00	130.50	98.0%
Netmedia	2006-11-03	5.00	8.50	98.5%
Multimedia	2006-11-13	12.00	13.50	86.7%
HTL-Strefa	2006-11-15	36.00	74.10	96.7%
Fota	2006-11-28	34.00	36.70	80.0%
Żurawie	2006-12-06	7.00	13.50	98.6%
Cinema City	2006-12-08	19.30	20.80	95.7%
Bakalland	2006-12-11	7.50	10.00	96.3%
Arteria	2006-12-15	18.00	23.01	99.5%
Monnari	2006-12-20	21.00	22.11	98.9%
LSI Software	2006-12-21	11.00	10.65	93.9%
Ruch	2006-12-22	16.00	18.56	97.0%
Eurotel	2006-12-28	14.00	16.59	94.0%
Plastbox	2006-12-29	21.00	21.25	96.5%
Procad	2007-01-15	35.00	38.50	98.0%
B3 System	2007-01-24	4.00	6.65	98.6%
Warimpex	2007-01-29	42.83	59.00	98.1%

Company	IPO date	Offer price (PLN)	Closing price on the first trading day (PLN)	Offer reduction
Kolastyna	2007-02-13	3.50	4.20	99.1%
Gadu-Gadu	2007-02-23	21.00	28.30	98.9%
ES-System	2007-03-09	5.80	7.00	94.6%
Seko	2007-03-15	15.50	15.38	81.9%
TF-One	2007-03-29	25.00	28.61	97.4%
Elektrotim	2007-04-11	18.00	24.60	96.7%
NTT System	2007-04-12	4.50	5.94	97.8%
Helio	2007-04-16	10.50	13.40	91.9%
Makarony	2007-04-18	9.00	11.80	96.3%
Radpol	2007-05-10	6.80	9.50	97.2%
Erbud	2007-05-11	50.00	74.00	98.3%
Pronox	2007-05-14	20.00	21.90	93.2%
Immoeast	2007-05-25	38.57	39.89	50.0%
Budvar Centr.	2007-05-28	15.00	23.50	99.4%
Noble Bank	2007-05-30	10.50	16.70	92.4%
ACE	2007-06-01	20.50	22.50	78.2%
J.W. Constr.	2007-06-04	71.00	92.00	98.0%
Polrest	2007-06-06	20.00	24.50	94.4%
Kredyt Incaso	2007-06-11	12.00	14.99	98.9%
MOJ	2007-06-13	6.30	6.89	96.9%
GF Premium	2007-06-14	28.00	26.80	82.8%
LC Corp	2007-06-29	6.50	6.60	98.1%
Komputronik	2007-07-09	39.10	49.60	91.3%
Makrum	2007-07-10	5.30	9.59	86.4%
Petrolinvest	2007-07-16	227.00	589.00	91.0%
Mercor	2007-07-19	41.00	40.00	82.0%
PA Nova	2007-07-20	38.00	38.00	90.1%
AMB Solid	2007-07-24	29.50	32.90	78.3%
Pol-Aqua	2007-07-30	77.00	77.00	90.9%
Armatrura	2007-07-31	1.80	2.14	96.9%
ZUK Stąp.	2007-08-03	30.00	30.00	97.6%
Quantum	2007-08-16	23.20	19.80	90.3%
Bomi	2007-08-20	23.00	18.90	90.0%
Krakchemia	2007-08-23	7.00	7.60	92.1%
Arcus	2007-09-10	17.00	14.20	0.0%
Oponeo	2007-09-12	8.00	8.25	75.9%
Energoinstal	2007-09-25	18.00	18.25	52.0%
Wola Info	2007-09-28	22.00	22.00	37.7%
Magellan	2007-10-01	42.00	45.00	0.0%
Rainbow	2007-10-09	9.00	9.00	28.3%
CP Energia	2007-10-10	9.00	9.85	39.0%
Orzeł Biały	2007-10-22	28.00	27.50	73.0%
Pani Teresa	2007-10-24	27.00	30.80	90.7%
Asbis	2007-10-30	6.50	6.92	0.0%
Integer.pl	2007-10-30	13.50	14.60	83.7%
Bipromet	2007-10-31	25.00	23.70	0.0%
Północ Nier.	2007-11-05	8.50	8.50	32.1%
Ronson	2007-11-05	5.75	5.75	13.7%
Introl	2007-11-08	11.50	9.99	86.2%
Complex	2007-11-14	5.00	4.90	65.8%
Asseco BS	2007-11-20	11.00	11.05	42.0%
Prima Moda	2007-11-20	12.00	11.00	0.0%
Kernel	2007-11-23	24.00	24.00	0.0%

Company	IPO date	Offer price (PLN)	Closing price on the first trading day (PLN)	Offer reduction
Wielton	2007-11-28	7.00	9.30	49.2%
City Interactive	2007-11-30	9.00	9.30	0.0%
Seco/Warwick	2007-12-05	37.00	39.60	0.0%
Konsorcjum Stali	2007-12-06	65.00	85.00	0.0%
Reinhold	2007-12-13	25.37	30.00	0.0%
Nepentes	2007-12-14	17.00	20.50	94.5%
EFH	2007-12-21	7.50	7.95	0.0%
Pol Mot	2007-12-27	4.00	4.18	0.0%
Atlas Estates	2008-02-12	14.32	16.00	0.0%
Optopol	2008-02-19	20.00	26.81	97.5%
ZM Herman	2008-02-28	1.80	1.91	0.0%
Skyline	2008-03-18	9.00	8.55	6.3%
Power Media	2008-03-20	5.00	5.00	40.2%
Trakcja Polska	2008-04-01	4.00	4.94	67.5%
Wojas	2008-04-02	9.50	8.88	0.0%
Hardex	2008-04-03	100.00	99.00	0.0%
Unibep	2008-04-08	9.00	9.61	90.0%
Selena FM	2008-04-18	33.00	32.25	0.2%
Belvedere	2008-04-21	434.80	421.00	0.0%
K2 INTERNET	2008-04-24	25.00	23.50	0.0%
ZBM Zremb	2008-04-25	130.00	115.00	0.0%
Cyfrowy Polsat	2008-05-06	12.50	13.14	88.5%
CAM Media	2008-05-07	10.00	10.80	19.9%
TF SKOK	2008-05-08	2.20	2.30	0.0%
Drewex	2008-05-15	5.00	5.00	10.9%
Kościuszko	2008-06-10	6.50	5.95	0.0%
Pozbud T&R	2008-06-11	2.40	2.00	0.0%
Sonel	2008-06-23	7.56	7.30	14.0%
ZA w Tarnowie	2008-06-30	19.50	15.99	49.6%
PZ CORMAY	2008-08-20	2.60	3.19	0.0%
Enea	2008-11-17	15.40	15.25	20.4%
Atrem	2008-12-18	7.60	6.70	0.0%
Anti	2008-12-30	3.60	4.14	0.0%
Bumech	2009-01-14	13.60	18.89	0.0%
GPM Vindexus	2009-03-23	6.00	7.80	0.0%
Aplisens	2009-05-25	6.00	6.65	41.9%
Ipopema	2009-05-26	5.00	5.87	0.0%
LW Bogdanka	2009-06-25	48.00	57.50	88.8%
Delko	2009-09-18	9.50	10.52	85.9%
Arctic Paper	2009-10-23	15.00	15.40	84.4%
PGE	2009-11-06	23.00	25.99	96.5%
Patentus	2009-11-09	2.30	2.45	89.6%
PCC Intermodal	2009-12-18	3.00	3.15	23.0%
Intakus	2009-12-22	2.20	2.12	0.0%
Eko Holding	2010-03-24	7.20	8.24	68.4%
Ferro	2010-04-14	10.60	12.69	79.2%
Berling	2010-04-15	7.00	7.40	66.0%
Dolnośląskie SS	2010-05-17	17.00	15.85	0.0%
KOV	2010-05-25	1.89	1.83	20.0%
ABC Data	2010-06-17	2.35	2.39	80.8%
Rank Progress	2010-07-08	10.77	10.70	97.8%
Harper Hygenics	2010-07-23	4.10	4.70	13.0%

Source: www.gpwinfostrefa.pl, www.gpw.pl, DM BZWBK